Equipping primary care physicians for the digital age

The Internet, online education, handheld computers, and telemedicine

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The knowledge needed to practice quality medicine has increased dramatically in the past 10 years and continues to do so exponentially. The number of new drugs is ever increasing, and the guidelines for screening and treating common diseases are constantly changing. For primary care physicians, who must maintain up-to-date knowledge of a broad scope of health conditions, the challenges are enormous.

KNOWLEDGE AT THE POINT OF CARE

Physicians are caring for an increasingly informed patient population, who know about medicine from pharmaceutical advertising, the Internet, and the growing alternative medicine industry. Much of this information is not scientifically sound. Busy primary care physicians often have little time or inadequate access to traditional sources of information to support their treatment choice or to refute or support the treatment ideas that patients have learned from other sources. In addition, physicians may be confronted by denials of treatment options from payers who claim the proposed treatment is not cost-effective or is unproved.

Today's physicians must be armed with better mechanisms for educating themselves and accessing an increasingly vast body of scientifically based information needed at the point of care. This is beginning to occur. From the use of the Internet for medical references, to handheld computers for pharmacy and formulary information, to online continuing medical education, to telemedicine consultations from specialists in their own offices, physicians are moving into the digital age. The challenge for most physicians is which of the new information technologies are practical and how they can best be used. In this article, we address three specific areas with which primary care physicians should be familiar—use of the Internet as a reference and continuing education source, handheld computer technology, and telemedicine.

INTERNET RESOURCES

The Internet has become an established tool in the delivery of health care. For health care professionals, the Internet offers tremendous potential to improve efficiency and bring the latest information to the point of care. More physicians are using the Internet as a source for medical reference and for continuing education.

Summary points

- Web sites can be a resource for clinical care or for continuing medical education, but their quality must be evaluated in a structured way
- Handheld computers offer mobile access to important reference materials and may decrease incidences of medical errors such as drug interactions
- Handheld computers can give physicians a point-of-service tool to practice evidence-based medicine
- Telemedicine allows specialty expertise to be brought to the point of care and customized to a particular patient and at the same time educates the primary care physician
- The use of telemedicine should be limited to appropriate patients, as determined through preexisting protocols, and it should be provided by an experienced organization with proven clinical skill

The question of quality

The challenge for physicians is to sift through a truly overwhelming number of World Wide Web sites to find those that contain the most comprehensible, reliable, evidence-based information. Studies have demonstrated that many web sites, including some sponsored by reputable organizations, do not contain high-quality, evidence-based medical content.[1,2] Whereas core standards for determining the overall quality of medical web sites have been proposed (Table),[3,4] ultimately physicians must be able to appraise the content quality of medical web sites, just as they must do printed medical information resources. The *User's Guides to the Medical Literature* series, originally published in *The Journal of the American Medical Association (JAMA)*, is an excellent starting point and is now available online.[5]

Finding information

For health professionals seeking to answer clinical questions, the approach to finding information varies depending on the type of information being sought.

Highly focused questions

The evidence-based medicine unit at McMaster University, Hamilton, Ontario, has shown that searches for answers to questions generated from clinical practice are gen-

Key elements in the assessment of web-site quality

Element	Question(s) to ask
Accessibility	Can the site be found using common search engines?
Attribution	Are references and sources for all content provided?
Authorship	Are authors and their affiliations and credentials provided?
Content	Is the information provided valid (critically appraise using the same methods as for printed resources)? Are linked sites valid?
Currency	Are the dates of posting and last update provided?
Disclosure	Is the "ownership" of the web site clear? Are advertising, underwriting, and other potential conflicts of interest made explicit?
Ease of use	Is the site easy to navigate? Does it load quickly? Do features work properly?
Innovation	Is the information delivered in a way that exploits the potential of multimedia without "overdoing it"?
Readability	What is the reading age level (may be calculated using modern word-processing programs)?

erally more fruitful and efficient for those who know how best to frame a question.[5] For highly focused clinical questions, for which one or a few "best evidence" articles are being sought, the National Library of Medicine's MEDLINE database is often useful (box 1). PubMed (also from the National Library of Medicine) provides web-based access to bibliographic information that includes MEDLINE and life science journals. However, because the typical primary care provider has time constraints that make an "on the fly" review of even one detailed research report unlikely, databases of brief, evidence-based summaries of studies have begun to proliferate. The Cochrane Library of Systematic Reviews is often an invaluable resource.

General information and information for patients

Thousands of sites provide medical information. Sites for physicians that are reputable, evidence-based, and useful for answering general questions, keeping up with new developments, and providing online continuing medical education credit include:

Box 1 Sources for physicians seeking answers to focused questions

- ACP [American College of Physicians] Journal Club: www.acponline.org/journals/acpjc/jcmenu.htm
- Clinical evidence: www.clinicalevidenceonline.com
- InfoRetriever (associated with the *Journal of Family Practice*): www.medicalinforetreiver.com
- Patient-Oriented Evidence that Matters (POEMs): www.jfponline.com
- The Cochrane Library: www.updateusa.com/clibhome/clib.htm

- American Academy of Family Physicians: www.aafp.org
- American Medical Association: www.ama-assn.org
- Centers for Disease Control and Prevention: www.cdc.gov
- National Guidelines Clearinghouse: www.guidelines.gov
- US Preventive Services Task Force: www.ahrq.gov/clinic/uspstfix.htm
- Best Treatments: www.besttreatments.org

Sites aimed at patients include Familydoctor.org (www.familydoctor.org), MEDLINEplus (www.nlm.nih.gov/medlineplus), and Best Treatments (www.besttreatments.org).

"All-in-one" resources

In the ongoing effort to combat the glut of poorly organized medical information on the Web and deliver the information that matters most to the point of care, "all-in-one" Web resources for physicians are now proliferating. Such sites include combinations of some or all of the following resources: consolidated search engines to search for information in multiple databases, journals, and electronic textbooks simultaneously; drug-prescribing information; Web-based electronic records; clinical prediction rules; and patient education materials. Examples of such resources are MD Consult (www.mdconsult.com) and Medscape (www.medscape.com). In addition, some feature the ability to download some resources to a handheld computer and to receive periodic updated information by electronic mail.

WEB-BASED CONTINUING EDUCATION FOR PHYSICIANS

In a 1997 study, about half of physicians surveyed said that they would be interested in computer-based continu-

ing medical education (CME).[6] A 1999 study found that at least 205 Internet sites host CME information, programs, or both.[7] Commercial sites were more likely to offer online CME than university sites, which were more likely to simply offer information about traditional programs. Much of the CME offered on the Internet had no fee for credit. In the same study, only 10% of CME offered provided any information on peer review of the content.[7] Few standards exist for controlling and measuring content quality on the Internet. The Accreditation Council for Continuing Medical Education is in the process of developing standards for online CME.

For primary care physicians, choosing from this mass of programs can be difficult. Physicians should ask themselves several basic questions (see box 2), similar to those that should be asked about any web site.

HANDHELD COMPUTERS

Handheld computers are becoming an important tool and have grown in popularity in the medical community in the past 5 years. These devices have evolved from simple data organizers and calculators to sophisticated reference and decision support tools.

Slawson and colleagues have advocated the concept of the physician as "information master."[8] This process includes finding information, judging the quality of the information, and integrating it into a physician's practice. Handheld devices have given physicians the ability to use reference materials at the point of care. Reference programs allow handheld computer users to access medical information at any location at any time.

Access to the Internet allows physicians opportunities to find valuable information necessary to practice medicine

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Box 2 Evaluating an online CME program

- What is the topic covered in the program, and is it relevant to my practice?
- Who is the organization providing this online CME, is it an accredited CME provider, who is the content provider (ie, the speaker), and who is the sponsor of the program?
- Why are they providing CME?
- Do they have the appropriate disclosure statements, or is it just a fancy advertisement?
- When was the content produced, and when was it updated?
- How much am I paying for the credit?
- If it is free, why is it free, who is paying for it, and why are they paying?

Pharmaceutical reference programs

Pharmaceutical reference programs are one of the most popular medical uses of the personal digital assistant (PDA). Many of these programs are available to clinicians for free. They provide drug information that includes treatment indications; pediatric, adult, or renal dosing; adverse reactions; and costs. Some programs automatically update changes in prescribing recommendations. Programs may include a mechanism to check a medication list for drug interactions. A survey done by investigators at Brigham and Women's Hospital in Boston found that physicians using the ePocrates pharmaceutical reference (www.epocrates.com) had fewer prescribing errors than those who did not.[9]

Electronic textbooks

"Electronic textbooks" are another medical reference tool that allows clinicians to carry traditional texts in their pocket and may be quickly searched for a keyword. Individual texts cost around $50 to $100, and discounted prices are available for multiple textbook packages. Titles include *5-Minute Clinical Consult*, *Harrison's Principles of Medicine*, and *Red Book 2000*.

Document managers

"Document managers" are applications that are used to create a personal library of brief documents on a handheld computer using text files. The user can create or share files made by other handheld users. Hundreds of medical text files for handheld computers are available for downloading from the Internet. Examples of text files include the *DSM-IV [Diagnostic and Statistical Manual of Mental Disorders, 4th Edition] Axis Criteria*, *NHLBI [National Heart, Lung and Blood Institute] Asthma Guidelines*, and *Folstein Mini Mental Status Exam*.

Medical calculators

Medical calculators, handheld computer programs, can be used for supporting clinical decisions. Several tools are available for calculations, including blood gas analysis, kidney function, electrolyte concentrations, body-mass index, and growth percentiles. Many programs consolidate multiple calculations to a single handheld computer application. Another application calculates gestational age based on sonographic appearance or last menstrual period. The program will also remind the user what interventions are appropriate for the gestational age.

Another type of medical calculator can be used to help physicians make evidence-based decisions. These decision-rule calculators allow the user to enter patient-specific data, and the handheld computer program then calculates the chances of a particular diagnosis or mortality figures. Popular calculators exist for the Bishop score for the induction of pregnancy, the Gail model for invasive breast cancer risk, Ranson's criteria for pancreatitis, and streptococcal pharyngitis score. The calculations are based on well-known studies, which are usually cited with each application. Another program provides evidence-based reviews, relative costs of different treatments for common illnesses, and various medical decision-rule calculators.

Clinical organizers

Physicians can use handheld computers to keep track of patients' names, medical record numbers, medications, and historical information. Many programs have been designed to keep a patient census for the physician. More sophisticated versions of these programs allow easy data entry and will create printable history and physical examination reports, daily progress notes, and end-of-the-day "sign-out" sheets. Handheld computer users who keep clinical data on their device need to maintain patient confidentiality and information security. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) mandates that electronic communications maintain patient confidentiality.[10] The US Department of Health and Human Services issued a final rule regarding the electronic data interchange in October 2000, and enforcement of this rule began in 2001.[11] To keep patient data confidential, physicians who keep clinical records on their handheld computer should not share their devices. They should also use a program that restricts access with a password.

Handheld devices give physicians mobile access to important information to help them make evidence-based decisions. As more physicians become comfortable integrating this technology into their practice, the quality and number of clinical applications will continue to grow.

TELEMEDICINE

Telemedicine is the provision of medical care from a distance using telecommunication technology.[12] Many types of technology and models are used, ranging from remote coverage of an inpatient intensive care unit to disease management using equipment that is placed in a patient's home.

Two forms of telemedicine are primarily used in specialty consultations: real-time interactive video-based consultation and asynchronous or "store-and-forward telemedicine." In the former, a videoconference between a remote provider and a patient—with or without the patient's local provider—occurs during the consultation. In store-and-forward telemedicine, information is gathered by the referring physician, including the patient's history, physical examination findings, laboratory results, and images, and is sent to a consultant. The consultant reviews this information, not necessarily immediately, then makes a diagnosis and/or treatment recommendations.

Telemedicine allows specialty expertise to be brought to the point of care and customized to a particular patient. The referring physician can be educated during the consultation. Telemedicine allows for a collaborative model of care that is difficult to recreate in traditional referral models. This can occur when the referring physician participates in an interactive video consultation, presents the patient to the consultant, and works with the consultant to review and implement diagnostic and treatment options.

In a telemedicine consultation, the specialist is currently limited to sight and sound—including the telestethoscopes, ophthalmoscopes, otoscopes, nasopharyngoscopes, colposcopes, and handheld cameras for wounds and skin lesions. Laboratory data, electrocardiograms, and imaging studies can be transmitted. This is more than adequate for many conditions in several specialties. In specialties in which the consultant needs to palpate or perform a procedure, the primary physician on site serves as a surrogate examiner.

Telemedicine now exists in all 50 states, and its use is rapidly increasing. In 1999, there were at least 75,000 video-based specialty consultations, and it is estimated that the number of consultations has dramatically increased since then.[13] Currently more than a dozen bills before Congress address some aspect of telemedicine. At least 18 states have addressed reimbursement through their Medicaid programs, and the Health Care Financing Administration will be dramatically expanding reimbursement because of the passage of provision 223 of HR 5661.[14] Third-party payers are beginning not only to reimburse for telemedicine, but also in California, Blue Cross is actively developing telemedicine programs in rural areas.

For primary care physicians, particularly in areas where specialty expertise is not locally available, telemedicine is likely to play an increasing role. In evaluating possible telemedicine relationships with a specialty provider, physicians should ask several key questions (see box 3).

Box 3 Evaluating possible telemedicine relationships with a specialty provider

- Does the specialty organization have expertise in the specialty area of need?
- Are they an experienced provider of telemedicine with an operational model that will provide the necessary service and convenience, including protocols that ensure that cases are appropriate for telemedicine?
- Who pays for and maintains the equipment?
- Who pays for the telecommunication costs?
- Have legal and security issues been addressed?

CONCLUSION

Advanced information and telecommunication technologies have tremendous potential in health care and can help to provide the increasing volume of information necessary to practice medicine. But physicians must continue to keep the needs of their patients and the need for the highest quality of care as the driving forces, rather than the technology.

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